brazing method disclosed in Scott reference does chemically bond the abrasive layer to the surface of the tooth." In previous office actions in the parent application, the Examiner has cited only col. 2, lines 43-45 of Scott in support of the comment. These lines read: "The cutting mesh is bonded to the support links by an adhesive agent such as industrial epoxy or by brazing." These lines do not state the abrasive layer is chemically bonded "to the surface of the tooth." No where in the Scott patent can one find mention of brazing of abrasive grain to the support links or to a "tooth" structure of the type Applicants employ.

For these reasons, reconsideration of the Examiner's "Response to Arguments" is requested.

Section 103(a) Rejection:

Applicants claims require a chemical bond between the abrasive grain and the core or tool substrate. Most conventional brazes chemically bond to the core (with or without diffusion bonding of the metals) but do not chemically bond to the abrasive grain. Only "active" or "reactive" brazes chemically bond to both the grain and the substrate. Applicants' position with respect to the differences among the invention tools and the prior art tools is the following (-- denotes a chemical bond; X denotes no chemical bond) :

1) Invention: Core--Braze--Abrasive Grain

2) Conventional Brazed SL Tool : Core--Braze X Abrasive Grain

3) Asada Electroplated Tool : Core X Metal Bond X Abrasive Grain

4) Scott Brazed Mesh Tool : Mesh--Braze X Abrasive Grain

5) Knippenberg Diamond Film Tools: Support--Braze--Diamond Film.

Only the invention and Knippenberg provide a chemical bond among all three elements. Because hard ceramic materials have surfaces that are notoriously difficult to "wet", a mechanical coating with a metal--either brazed or electroplated--on diamond or CBN is quite a weak bond. Knippenberg distinguishes (at col. 1, lines 45-59, and col. 2, lines 4-13) the bonding of single diamond

grains from the bonding of "diamond" of the type disclosed in Examples 1, 2 and 3, wherein devices, including a plate, rod or bearing, constructed of diamond film are described. The diamond tools taught by Knippenberg represent different art fields than Applicants' abrasive cutting tools and offer hard, wear resistant contact surfaces in applications presenting much less mechanical shear during operation than the abrasive contact surfaces designed by Applicants. Knippenberg's diamond tools do not suggest the Applicants' designs for improved retention and abrasion performance of abrasive grain.

The Applicants' position regarding chemically bound abrasive grain is reflected in inventor Buljan's Section 1.132 declaration submitted in the parent application (copy attached) wherein Buljan states an electroplated tool is inferior in a grinding performance test to a "brazed single layer tool made with a bronze braze that is chemically bonded to the diamond abrasive." In paragraphs 4 and 5, Buljan gives his opinion as an expert in this technology that cutting tools made with an active braze in place of an electroplated bond would exhibit the same types of performance improvements in tool life and tool wear as did the grinding tools he had tested. His opinion is based on the differences in strength and durability of the mechanical bond to the grain formed in electroplating versus a chemical bond to the grain formed with an active braze.

To chemically bond diamond or CBN abrasive grain to a metallic substrate surface, the bonding agent is preferably an active braze or other composition comprising an element reactive with the carbon or the nitride on the surface of the grain to form a carbide or nitride compound. For example, the preferred reactive braze used in the invention may contain a nickel-chromium material, or a bronze-titanium material. (See page 19, lines 9-17.) Under appropriate brazing conditions known to those skilled in the art, the titanium forms titanium carbide material at the surface of the diamond grain, thus creating a chemical bond to the braze and the substrate. In addition, the grain may be coated (physically or chemically) with a material such as titanium or tungsten which also chemically bonds the abrasive grain to the components of the braze under brazing conditions (See page 19, lines 20-22).

Applicants' claims require a chemical bond between the abrasive grain and the tool in addition to all other elements of the claimed invention. Applicants are not merely claiming a tool having chemically bonded abrasive grain. The tool defined in claims 1 and 28 is much more than just a tool made with chemically bonded abrasive grain. The mechanical and geometric designs of the claimed tools as specified in claims 1 and 28 are neither disclosed nor suggested in the cited art.

Asada forbids the presence of an "initial uppermost cutting level" of abrasive grain in the tools of his invention. As set forth in col. 1, lines 62-68 and col. 3, lines 38-46, Asada's tools are distinguished from those of the prior art principally on the basis of Asada's processing step where he removes the initial layer of abrasive grain from the top of the teeth of the tool. These grains are removed to yield consistent wear performance during grinding so as to avoid the conventional construction of tools with grain present in an initial, outermost layer, on top of the teeth because "the conventional construction has the drawbacks in that the users tend to miss the time of exchange or to misunderstand the blade for a defective one." See col. 1, lines 38-40, and Figs. 6, 9, 11 and 12.

Thus, Asada teaches away from Applicants findings that an initial layer of grain on the top of the tooth is a desirable and essential aspect of the tools of Applicants' invention, as stated in each of claims 1 and 28, subparagraph (c). Further, Applicants' tools demonstrate none of the performance drawbacks associated by Asada with prior art tools (See Applicants' Fig. 2 and Examples).

Scott's disclosure of a negative rake angle in the cutting elements of the tool chain is not relevant to claim 1 and claims 3-26. Scott fails to suggest the desirability of a cutting tool having a tooth cutting structure extending from a monolithic substrate. Scott fails to suggest a cutting tool having successive cutting levels and fails to suggest Applicants' design, i.e., "each cutting level on each tooth being oriented such that a portion of each cutting level overlaps at least a portion of each other cutting level of the tooth." The row of abrasive grains in each mesh cutting element of Scott is not supported by monolithic metal, does not overlap the next row of grain, and is not supported-at least

partially- by an additional row of abrasive grains. Scott's design cannot yield the benefits of high cutting rate, high penetration rate and long tool life observed with the chemically bonded grain and geometric designs specified for the tools of Applicants' invention.

As noted above, Applicants are unable to locate a teaching of any brazed **abrasive grain** in Scott, or in patents cited by Scott and relating to the mesh cutting elements Scott uses (i.e., US Pat. No. 5,049,165 to Tselesin and US Pat No. 4,925,457 to deKok, et al). The text in Scott cited previously by the Examiner (col. 2, lines 43-45) concerns brazing the mesh cutting elements to the links of the supporting chain. It does not concern brazing the abrasive grain to the mesh cutting elements. As for the circular saw suggested by Scott, the suggestion merely is to use an "inclined mesh cutting surface" on the saw. See col. 8, lines 16-18, of Scott. Applicants designs are not suggested.

For these reasons, Applicants' invention is non-obvious over the cited patents.

CONCLUSION

In view of the remarks submitted herein, Applicants respectfully request reconsideration of the rejection and an allowance of the claims.

Respectfully submitted,

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